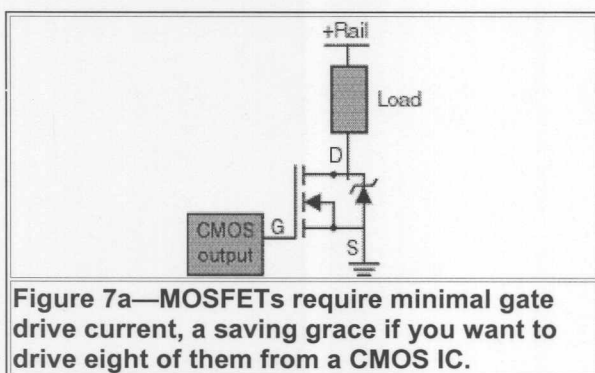


Enhancement-mode MOSFETs are a natural choice for overcoming the base drive problems associated with the BJT circuits shown in Figure 6.

Figure 7a shows a simple low-side drive. International Rectifier and Siliconix both have nice selections of MOSFETs. Recently, I've been tinkering with the IRFL014 and IRL014N from International Rectifier. These parts are in a SOT-223 surface-mount package and cost between \$0.30 and \$0.50.

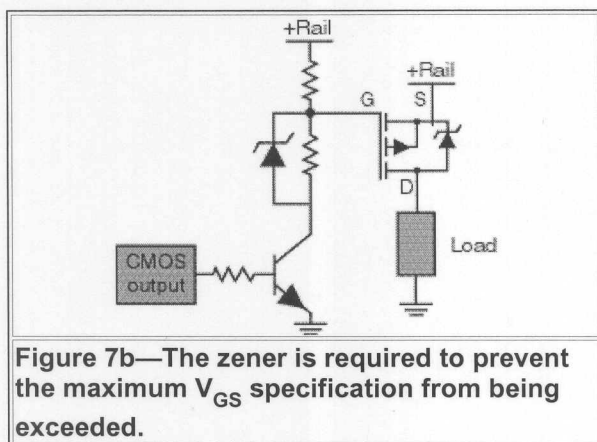


Driving these devices is much like driving a capacitor. Once the gate is charged, the leakage current from the gate to the channel is negligible in this application. The biggest difficulty is getting the MOSFET to turn on hard with only a 5-V V_{GS} .

The less expensive IRFL014 with a 5-V gate drive will easily handle channel currents of 500 mA. The IRL014N is designed to be turned on with a 5-V V_{GS} , although the maximum allowable V_{GS} is ± 15 V.

The primary disadvantage of MOSFETs over BJTs is cost. The 2N2222s are just a few pennies. SuperSOTs (like the FMMT625) are just 25 to 30 cents. MOSFETs start at 30 cents and go up rapidly.

Figure 7b shows how to use a P-channel MOSFET to build a high side switch. When +RAIL is at a relatively low voltage, we have the problem of not being able to fully turn on the MOSFET. This happens because we can't develop a high V_{GS} . At high voltages on +RAIL, we need to limit V_{GS} to avoid exceeding the maximum allowable V_{GS} .



International Rectifier's IRFL9014 is a P-channel MOSFET suitable for building low-cost, high-current drivers. At +RAIL voltages of 7–10 V, the MOSFET is turned on. The part really shines at V_{GS} 's of 15 V. The minimum $R_{DS(ON)}$ for this device is 0.50 ohms, but the device only costs around \$0.40.

The maximum V_{GS} permitted on the IRFL9014 is 20 V. The zener shown in Figure 7b must be selected to limit V_{GS} from exceeding this maximum.

Sourcing drivers built like those shown in Figure 7b can source higher currents when +RAIL is at higher voltages because we can develop a near maximum V_{GS} on the MOSFET, thus turning it on fully.